EC421: International Economics

International Macroeconomics

Problem Set 1

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1 Two-Period Endowment Economy

Consider the two-country, two-period endowment economy discussed in Lecture 1 (OR, chapter 1). Assume the representative household in the Home country maximise:

$$U = \ln c_1 + \beta \ln c_2,$$

with $\beta \in (0,1)$. The representative household in the foreign country has the same preferences over $\{c_1^*, c_2^*\}$.

(a) Let $\{y_1, y_2\}$ denote the Home endowment in the two period. Solve for Home consumption in the first period.

(b) Solve for Home savings in the first period.

(c) Let $\{y_1^*, y_2^*\}$ denote the Foreign endowment in the two period. Solve for the equilibrium world interest rate.

(d) Show that the world interest rate lies in between the real interest under autarky in the two countries.

(e) Show that the country with an autarky interest rate lower than the world interest rate will run a current account surplus in period 1.

(f) What is the effect of an increase in the growth rate of Foreign output on Home's welfare?

2 Persistent Output Growth

Consider the stochastic infinite horizon small open endowment economy model discussed in Lecture 1 (OR, chapter 2; SGU, chapter 2). Assume utility is quadratic and that $\beta(1+r) = 1$.

(a) Show that the one-period change in consumption equals the present discounted value of the change in expected future output levels:

$$c_{t+1} - c_t = \frac{r}{1+r} \sum_{j=0}^{\infty} \frac{(\mathbb{E}_{t+1} - \mathbb{E}_t)y_{t+1+j}}{(1+r)^j}.$$

(b) Suppose output follows an AR(1) process in first differences

$$y_{t+1} - y_t = \rho(y_t - y_{t-1}) + \epsilon_{t+1},$$

where $\rho \in (0,1)$ and $\epsilon \sim i.i.d.\ \mathcal{N}(0, \sigma_\epsilon^2)$. Show that $\forall j > 0$:

$$(\mathbb{E}_{t+1} - \mathbb{E}_t)y_{t+j} = \frac{1 - \rho^j}{1 - \rho}\epsilon_{t+1}.$$

(c) Derive an expression for consumption growth as a function of output innovations $y_{t+1} - \mathbb{E}_t y_{t+1}$.

(d) What is the implication for the innovations in consumption as a function of the innovations in output?

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(e) What is the response of the current account to an innovation in output?

3 Open Production Economy with Specialised Imports

Consider a small open economy existing for two periods, 1 and 2, populated by many identical agents with preferences:

$$\ln c_1 + \beta \ln c_2,$$

At time 1, the residents are endowed with an exogenous amount of y_1 of output. They can invest their savings either in foreign assets, b_1, which yield the world interest rate, $1 + r$, or in domestic projects, i_1, which yield output in period 2, Y_2, with decreasing returns:

$$Y_2 = Ai_1^\alpha$$

The initial net foreign wealth is zero ($b_0 = 0$), so that b_1 coincides with the current account (i.e. $b_1 - b_0 = b_1 < 0$ represents the current account deficit). Investing in project i_1 requires a specialised imported input, at the price p units of output. Hence it costs $p \cdot i_1$ units of output (=consumption).

(a) Use the production function and budget constraints, construct the intertemporal production possibility frontier (IPPF) of available consumption bundles, under financial autarky.

(b) Graph the IPPF and show some of its properties.

(c) How does the IPPF change if the price of the imported input, p, falls? Explain.

(d) Write down the budget constraint of the country in the two periods (including b_1) and the problem of the representative consumer. Derive the first order conditions characterising the optimal consumption and investment decisions.

(e) Define and derive the interest rate under financial autarky, r^{Aut}. Is r^{Aut} increasing/decreasing in p? And in A?

(f) Assume that preferences and technology are such that $1 + r^{Aut} > 1 + r$. Is the current account going to be positive or negative? Explain.

(g) Derive the consumption and investment plans if agents can trade the international bond.